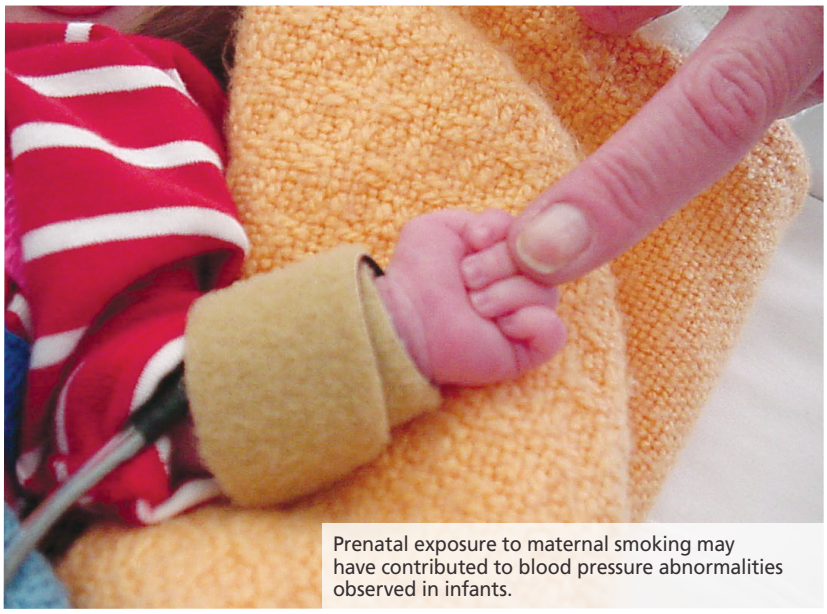
CHILDREN'S HEALTH

Secondhand Smoke Exposure May Alter Fetal Blood Pressure Programming



Prenatal exposure to maternal smoking may have contributed to blood pressure abnormalities observed in infants.

Gary Cohen

Babies born to mothers who smoke cigarettes may be at risk for abnormal blood pressure and heart rate control at birth, suggests research published in the March 2010 issue of *Hypertension*. The results of the new study further hint that this control may become worse as exposure to secondhand smoke continues, perhaps increasing the risk of developing hypertension in later life.

The study compared the heart rate and blood pressure control of 19 infants born to nonsmokers with those of 17 infants whose mothers reported smoking an average of 15 cigarettes per day before and after giving birth. The resting blood pressure of the infants in both groups followed essentially the same developmental trend over the first year of life, although the smoke-exposed infants had higher diastolic blood pressure at age 3 months. The resting heart rate of both groups also was similar and followed the same trend up to age 3 months. But by 1 year the resting heart rate of the smoke-exposed infants averaged 20% slower than that of their unexposed counterparts.

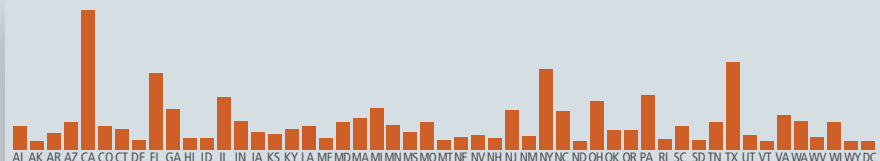
The researchers also monitored changes in heart rate and blood pressure over a span of 40 beats as the infants, sleeping soundly on tilt tables, were raised from a supine position to an inclination of 60° over 5 seconds and held in that position for 1 minute. "As the body becomes more upright, the heart rate should rise temporarily, and different blood vessels should constrict to increase the blood pressure and ensure enough blood gets to the brain," explains first author Gary Cohen, a senior research scientist in the Department of Women's and Children's Health at the Karolinska Institute, Stockholm. Sure enough, that is what the authors observed for the nonexposed infants, with peak values becoming somewhat higher between 1 week and 1 year as expected.

The Beat

by Erin E. Dooley

Foodborne Illness Costs: No Small Potatoes for the United States

The Produce Safety Project of The Pew Charitable Trusts estimated in March 2010 that foodborne illnesses cost the United States $152 billion each year and each citizen an average of $1,850 per case. The report, available at www.makeourfoodsafe.org, based its estimate on medical costs as well as costs due to lost life expectancy, pain and suffering, and functional disability. The CDC estimates more than 76 million new cases of foodborne illness resulting in 5,000 deaths and 325,000 hospitalizations occur each year in the United States.



National Comparison of Annual Health-Related Costs of Foodborne Illness
Source: http://www.makeourfoodsafe.org/cost_map

TSCA Information Now Free Online

The EPA announced 15 March 2010 it will now provide free online access to the Toxic Substances Control Act Chemical Substance Inventory, which provides data on thousands of industrial chemicals. Until now, this consolidated set of information was available only by purchase. The move is part of the agency's stated priority of making chemical information more accessible to the public and follows a January announcement that the EPA is seeking to reduce some confidentiality claims on the identity of chemicals (read more about chemical confidentiality on p. A168 of this issue). The inventory is available at http://www.epa.gov/oppt/newchems/pubs/invntory.htm.

Paint and contaminated dust are major sources of lead exposure in U.S. children.

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New Lead Paint Rule Takes Effect

Effective 10 April 2010 all renovations of housing constructed before 1978 and of child-occupied facilities (such as schools) must be performed by certified renovators using specific lead-safe work practices. "Renovation" is defined broadly under the EPA rule to include window repair, weatherization, and modification of painted doors. The new regulation goes beyond earlier tenant notification stipulations by

The exposed infants showed a similar trend over time. However, between 3 months and 1 year their responses became exaggerated, with their heart rate rising faster (and increasing by an average of 11.5% instead of the 6.5% seen in the nonexposed babies) before falling more quickly. Their diastolic blood pressure followed suit.

When the nonexposed infants were tilted and maintained upright, sustained rises in systolic, diastolic, and mean blood pressure of 2–3% were seen at age 1 week, rising to 8–10% by 1 year as expected. In contrast, in the exposed infants the increases in blood pressure were nearly double at age 1 week but failed to increase over time.

"Thus, the newborns of smokers hyperreact to positional change, but by the time they are one year old and want to stand up they are underreacting; their routine blood pressure compensation systems just don't work properly," says Cohen. "It would appear that neither their heart rate nor sympathetic constrictor tone [impulses from the sympathetic nervous system that help control blood vessel constriction] are properly 'programmed' even at birth, with things getting worse over time."

This programming problem could lie in an overly strong sympathetic tone caused by exposure to some compound in cigarette smoke in the womb and after birth, the researchers say. This might slowly increase vascular resistance, leading to the increased diastolic blood pressure seen at rest at 3 months, and the eventual loss of sympathetic reactivity.

The authors further hypothesize that the fall in heart rate observed in exposed infants at age 1 year was an attempt to restore some kind of equilibrium. Unfortunately, this reprogramming solution appears to hinder proper positional blood pressure control, "and there is evidence this could increase the chances of hypertension later on," explains Cohen.

In adults, cardiovascular pathophysiology can involve chronic sympathetic overactivity leading to increased blood pressure. The authors suggest something similar may be happening in the children they studied.

"[Whether these observations can be] explained by alterations in central sympathetic outflow requires further investigation as this was not directly assessed in this study," remarks James Fisher, a lecturer in exercise physiology in the School of Sport and Exercise Sciences, University of Birmingham who was not involved in the study. "As is often the case with good research, we are left with more questions than answers. Is the altered cardiovascular reactivity specific to postural stress, or is it more generalized? What is the biological significance of the magnitude of the alteration in cardiovascular reactivity? How permanent is the 'reprogramming,' and is it reversible if smoke exposure is withdrawn?"

"The newborns of smokers hyperreact to positional change, but by the time they are one year old and want to stand up they are underreacting; their routine blood pressure compensation systems just don't work properly."

Although interesting, the study is rather small. "I would like to see confirmation in a larger study," says Mark Caulfield, director of the William Harvey Research Institute at Barts and The London School of Medicine and Dentistry, "with formal proof of cigarette consumption status in each of the study groups before drawing a firm conclusion."

Adrian Burton is a biologist living in Spain who also writes regularly for *The Lancet Oncology*, *The Lancet Neurology*, and *Frontiers in Ecology and the Environment*.

requiring that renovators post warning signs at the remodeling site to inform workers and occupants of lead hazards. Contractors also must now follow lead dust containment and waste management procedures. The EPA provides more information for contractors, certification trainers, homeowners, and landlords at www.epa.gov/getleadsafe.

UNEP Offers E-Waste Predictions, Guidance

The world's stockpile of e-waste—discarded computers, mobile phones, and other electronic devices—is growing by an estimated 40 million tons per year with little sign of stopping. In *Recycling—From E-Waste to Resources*, released 22 February 2010, UNEP estimates the number of discarded computers shipped to some developing countries could increase by as much as 500% by 2020. The informal recycling of electronics is a lucrative but highly hazardous cottage industry in many developing countries. The UNEP report therefore offers guidance for countries to build successful and safer e-waste management systems.

Review of Environmental Factors in Malaria's Spread

A review by Luis Fernando Chaves and Constantianus Koenraadt in the March 2010 *Quarterly Review of Biology* assesses the factors contributing to increases in malaria cases worldwide. The researchers report that climate change, human migration, and land-use changes all are causing malaria to spread into highland areas of East Africa, Indonesia, Afghanistan, and elsewhere. They systematically show how climate affects multiple biological components of malaria transmission and highlight the need for research to better understand the transmission dynamics of this disease and how to sustainably control or eliminate it.

PAHs: Pathways to Waterways

Polycyclic aromatic hydrocarbons (PAHs), chemicals released during combustion of biomass and fossil fuels, are ubiquitous in the environment. Lisa Rodenburg and colleagues undertook a 4-year study to identify the primary routes by which PAHs end up in New York/New Jersey Harbor. Their findings, reported in the March–April 2010 *Journal of Environmental Quality*, show stormwater runoff was the main pathway, contributing about half the harbor's PAH load, and atmospheric deposition was an important contributor of smaller PAH compounds. The results suggest that minimizing the flow of PAHs into waterways may require tweaking stormwater management plans to control runoff.

Stormwater runoff is a major route by which PAHs enter waterways.

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